EFFECTIVENESS OF MISTBLOWN LINDANE AGAINST THE PINE ENGRAVER BEETLE, IPS PINI (SAY), IN PONDEROSA PINE SLASH

BOISE NATIONAL FOREST AND
IDAHO DEPARTMENT OF LANDS
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EFFECTIVENESS OF MISTBLOWN LINDANE AGAINST THE PINE ENGRAVER BEETLE, IPS PINI (SAY), INFESTING PONDEROSA PINE SLASH - AN EVALUATION CONDUCTED ON THE BOISE NATIONAL FOREST AND STATE OF IDAHO LANDS IN COOPERATION WITH THE IDAHO DEPARTMENT OF LANDS, 1973

By

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INTRODUCTION

When engraver beetles, Ips spp., are provided opportunity to build up in fresh logging slash or storm breakage, they often emerge and kill large groups of standing trees. A number of species cause economic damage in various pine growing areas of the United States. In southern Idaho the pine engraver beetle, Ips pini (Say), is the primary species infesting young ponderosa pine. Tree killing attributed to beetles that emerge from slash created by logging operations, within the lower elevation range of ponderosa pine, occur almost every year on the Boise National Forest, other federal, State and private lands.

Since tree killing caused by Ips commonly occurs in groups, the resultant concentrations of "faded" trees look striking and offhand losses appear excessive. In the spring of 1973 some systematic observations of Ips activity were begun to gain an insight into just how important some of these losses may be under certain conditions.

The opportunity arose in which four cutting units, none closer than 7 miles apart, were utilized for evaluation (see map). Optimum weather conditions helped produce enormous populations of Ips in almost 100 percent of the slash in all of the units early in the spring.

The original intention was to follow beetle activity through the season in these cutting units. However, what started out as an evaluation of Ips activity and related damage, ended primarily as a control project. When the District Ranger on the Boise District, Boise National Forest, was informed of the impending beetle threat, he chose to treat infested slash within three of the units with lindane to prevent tree losses in the residual stands as had occurred in Trail Creek in 1972 (Starr). Spring burning of slash was the only other real alternative available to him and although burning would have been an effective control of Ips at this time, the danger of escape into a wildfire was too great.

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DESCRIPTION OF STUDY UNITS

In the Virgil Gulch, Trail Creek, and Long Gulch units tree cutting was terminated in November 1972. Wet Gulch, a State of Idaho timber sale, was cut during January and the last week in April 1973. The Wet Gulch cutting unit was observed as an untreated "check" to compare with results of lindane treatments in the other three units. An abundance of slash in all of the units remained in highly suitable condition as Ips host material into the spring of 1973.

Treated Areas

Virgil Gulch: Treated infested slash in Virgil Gulch sale consisted of long tops and limbs resulting from removal of 12 MBF/acre of an uneven age class up to 200 year old trees on 55 acres. The residual stand was composed of seed trees with an average dbh of 13 inches spaced at 30-foot intervals. Original square feet of basal area was reduced from 110 to 45. Surrounding uncut stands contained dense stocking of sapling and pole sizes.

Trail Creek: Infested slash in the Trail Creek sale consisted of long tops and limbs from removal of 8.5 MBF/acre of an uneven age class up to 120 year old trees in addition to whole thinned trees 6-8 inches dbh (500/acre) on about 10 acres of the 35 acres treated. The residual stand consisted of seed trees with a mean dbh of 13 inches left at 30-foot intervals. Original square feet of basal area was reduced from 110 to 45. Adjoining uncut stands contained dense stocking of sapling and pole sizes.

Long Gulch: Treated infested slash in Long Gulch consisted of thinned whole trees 6-8 inches dbh (500/acre) on 10 acres. This was a pre-commercial thinning where residual trees were left at an 18-foot spacing. Average leave tree size was 9 inches dbh. Original square feet of basal area was reduced from 100 to 60.

Untreated "Check" Area

Wet Gulch: Infested slash in Wet Gulch "check" sale consisted of long tops and limbs resulting from removal of 6.8 MBF/acre of an uneven age class up to 140 year old trees on 353 net acres. Large groups of trees in the residual stand contained dense stocking of saplings and poles as well as larger leave trees. Additional slash was created when 147 of these acres were precommercially thinned. Thinning was started on July 30, at least two weeks after complete emergence of first generation Ips from logging slash. Original square feet of basal area was reduced from 128 to 80 in the unthinned area and to 55 in the thinned area.

METHODS

Timing of Lindane Application

Ips flight activity and brood development were monitored for timing of mist application so that lindane was applied subsequent to overwinter flight and prior to emergence of new brood from slash. Examination of brood was accomplished by periodic removal of bark samples from infested pieces with a hatchet. Percent of each insect life stage was determined from counts of eggs, larvae, pupae, callows and adults. Sequential examinations insured a continuing awareness of time remaining for treatment prior to flight of beetles from slash in each of the treating units.

Ips had begun to emerge from overwinter sites and to fill-in green slash by April 16. Emergence and fill-in were completed by about May 21, as noted from cessation of new attacks or "starts" in green slash. By then nearly all of the slash had been heavily attacked and high density broods were developing, Figure 2. Intensity of Ips infestation within all study units was comparable. On the last day of treating in each unit broods were still immature.

Treatment with Lindane

Beetle infested slash in Virgil Gulch, Trail Creek and Long Gulch was treated with mistblown lindane beginning on May 24 and ending on June 27.

Treatment Technique

Ervol Sheffield*, the project leader, coordinated overall treatment activities in the field including quality control and safety. An entomologist or qualified technician visited the project daily to provide technical assistance.

Stored bulk lindane (excess from earlier projects) was tested by the Idaho State chemist, met label specifications and was used on the project. The miscible 20 percent concentrate was diluted in #2 diesel fuel at the ratio of 1:15 to make a 1.5 percent (by weight) finished spray. Convenient mixing on the job site was accomplished in the 150 gallon tank of a portable Bean orchard sprayer. Solo brand, back-pack mistblowers, Model 423, were used to spray individual infested slash pieces, Figure 3. Two or three mistblowers were operated each day by an average crew of five and mist was applied just short of the runoff stage. The crew rotated jobs. Whoever mixed insecticide also serviced and maintained the mistblowers and assisted in loading and unloading them to and from the shoulders of operators. Diesel fuel was hauled by pickup to the mixing site in 55 gallon drums and lindane concentrate in 5 gallon "jeep" cans. Finished insecticide

*Engineering Equipment Operator, Boise Ranger District.

was supplied in "jeep" cans to the mistblower operators by pack horse and mule. Progress on the ground was delineated by flagging treated slash piles and by stringlining strips of scattered slash.

SAFETY

Operators wore approved face masks, goggles and neoprene impregnated gloves. Chemical canisters and filters in the masks were replaced regularly prior to time limit expiration. Safety meetings emphasized safe operation of the mistblowers. Frequent changes of clothing by mistblower operators to prevent skin contamination proved much more acceptable than wearing uncomfortably hot, oil repellent clothing. Adequate water, soap, clean towels and rags were kept on hand for cleanup. None of the workers suffered any noticeable ill effects from the lindane.

EFFICACY OF CONTROL

Emergence of first generation beetles from slash and flight to standing trees was completed by July 15. In late August and September subsequent to tree fading in the "check," an aerial survey was flown followed by ground checking in all units to assess spray efficiency. Current season's Ips-killed trees were counted and recorded as a basis for control effectiveness. The "check" was cruised and Ips caused volume losses measured. A summary follows presenting post-control conditions in each of the units:

1. Virgil Gulch Treating Unit: About a mile to the southwest of the cutting boundary a group of 25 faded trees was found that had been killed by Ips. Two additional Ips fader groups appeared about a mile to the east totaling about 60 trees. Origin of beetles making these attacks could not be determined. There were other logging sales in the area.

2. Trail Creek Treating Unit: Scattered, low numbers of faders outside the cutting boundary were found and determined to be attacked by the western pine beetle, Dendroctonus brevicomis Lec., although tops had been invaded by Ips.

3. Long Gulch Treating Unit: No faders appeared within the unit or within the surrounding drainage.

4. Wet Gulch "Check" Unit: Engraver beetle populations emerged from slash and killed 926 trees primarily in overstocked younger growth within the residual stand. Trees ranged in size from 2 to 25 inches dbh, Figure 1. Mortality occurred as 24 single trees and 41 groups that averaged 22 trees each scattered across the sale area. Most killed groups were fairly close to heavier slash concentrations. Sixty five percent (598 trees) fell into unmerchantable sizes 2 to 8 inches dbh. Total volume of merchantable sizes killed (328 trees, 8 inches dbh and larger)

was equal to 0.76 percent of the cut volume (18,461 b.f. or 52 b.f./acre). Average size of a killed group covered 0.04 acre and all killed groups totaled 1.6 acres on the gross sale area. Low numbers of widely scattered faders outside the sale area were detected but not measured.

Almost complete control was obtained in the lindane treatments. No leave trees within or adjacent to treated cutting unit boundaries were lost to Ips.

COSTS

The Boise Ranger District incurred expenses of $44.00 per acre for the total project cost. These costs include 952-man hours covering part or all of 23 working days or 9.5 man hours to treat each acre of slash. Total area covered was 100 acres.

DISCUSSION OF RESULTS

If we correlate Ips losses in the "check" area with required utilization in a timber sale, an interesting point may be noted. According to Forest Service standards, a utilization scale may be made in a timber sale where more than incidental amounts of cut, merchantable material are left unutilized. Defined standards, in part, are that whenever a 500 b.f./acre volume is suspected or found by a sale administrator or an inspector, a utilization scale should be conducted. On a sale where the cut volume is 10 MBF/acre, using a hypothetical case, 500 b.f. is equal to 5 percent of this volume and if 500 b.f. had been left unutilized in Wet Gulch it would have been equal to 7 percent of the 6.8 MBF/acre cut. Relating such volumes to the 0.76 percent of loss to Ips in Wet Gulch, the beetle-killed volume may be called an incidental amount.

Although most of the Ips damage had been done by the first generation of beetles in Wet Gulch, a precommercial thinning on 147 acres of the residual stand was begun on July 30 and the resulting slash absorbed the "tail end" of the second flight of beetles. It is believed that if thinning had been started about one month earlier, few standing trees would have been killed by the first generation. Thinning was continued through August 29.

An 18x18 foot spacing was sought during thinning. Average stocking where Ips mortality took place measured less than 7x7 feet prior to Ips attack. In a 7x7 spacing more than 5 out of 9 trees would be cut to achieve an 18x18 spacing; therefore, most of the trees killed by Ips would have been cut during a thinning. In addition, residual green tree stocking within Ips-killed groups usually remained adequate.

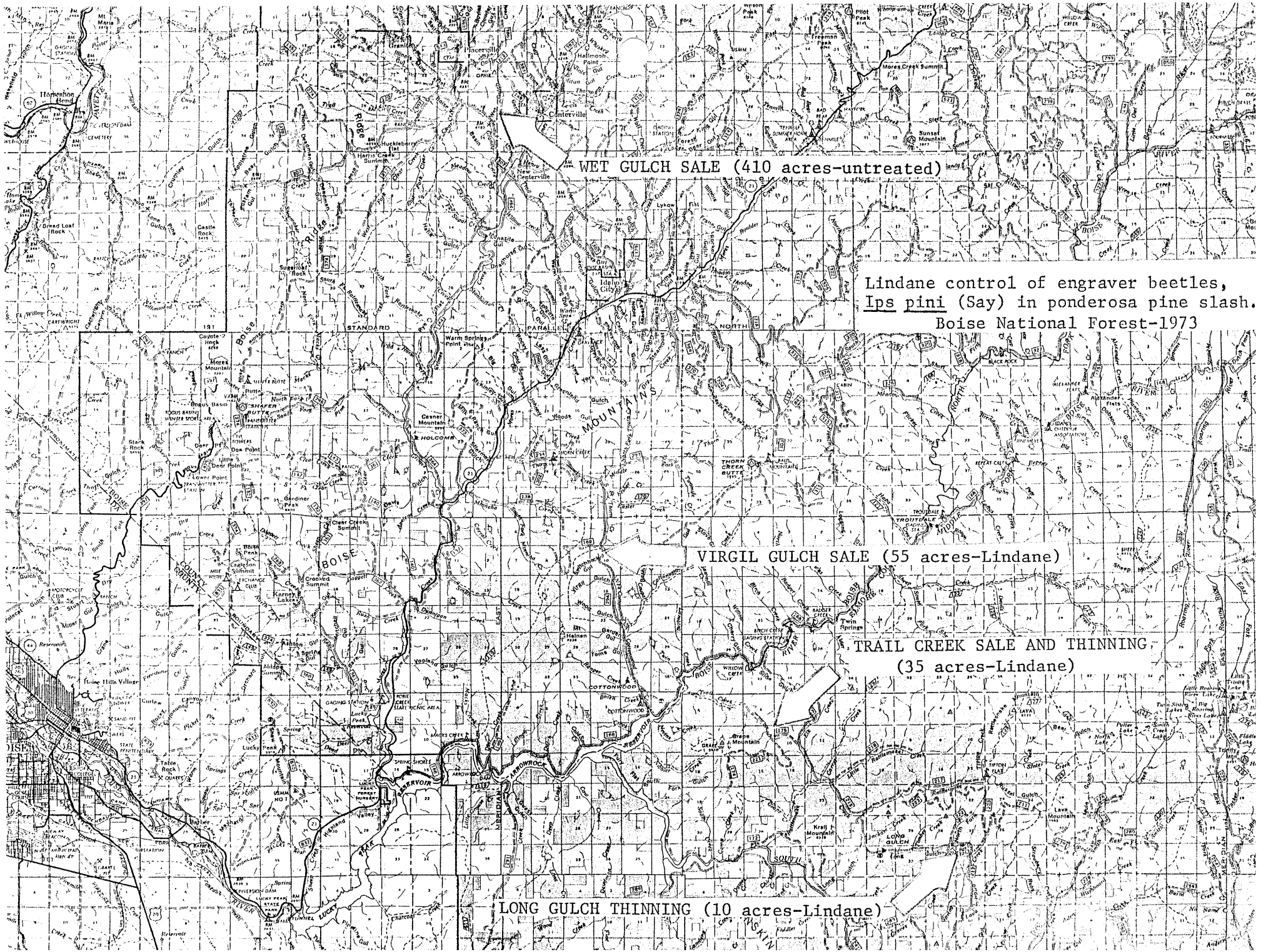
The merchantable volume killed by Ips in the "check" area amounted to 52 b.f./acre. Projected as potential Ips losses into the treated areas where there was an estimated one third more slash (based on the greater mean volume cut per acre of 10.4 MBF compared to 6.8 MBF in the "check" in similar type stands) this would become 79 b.f./acre. Hypothetical total merchantable volume lost, if slash had been left untreated would then have been 7.9 MBF on the 100 treated acres in Virgil Gulch, Trail Creek and Long Gulch. If we accept this, some examples of merchantable losses could have been as many as 329 leave trees of 8 inches dbh (ave. vol./tree 24 b.f.) or 197 trees 9 inches dbh (ave. vol./tree 40 b.f.). Based on the total chemical cost of $4,400 to protect these same ponderosa pine trees by lindane treatment of slash the cost break down per individual tree saved is $13.37 and $22.33 for the 8 and 9 inch sizes respectively.

An amount of damage almost the same in magnitude as that projected for the treated units, assuming they had been left untreated, actually occurred on an 80-acre cutting unit in Trail Creek in 1972 where merchantable tree losses from Ips measured 87 b.f./acre in the residual stand when logging was discontinued in mid-summer (Starr).

In conclusion, the spray project was conducted safely without accident and with very satisfactory results. No adverse effects were noted relating to other plant or animal life. Lindane treatment protected leave trees that were selected for seed and future crop trees. Better than average trees have been selected for future management on the basis of a number of quality factors. The cost of saving such selected trees is substantial and should be weighed against the value of the residual trees before considering application of lindane.

References

1. STARR, George H. Biological evaluation, pine engraver beetle in second growth ponderosa pine, Trail Creek Timber Sale, Boise National Forest, Idaho, 1972. Unpublished timber management report.


WET GULCH SALE (410 acres-untreated)
VIRGIL GULCH SALE (55 acres-Lindane)
TRAIL CREEK SALE AND THINNING
(35 acres-Lindane)
LONG GULCH THINNING (10 acres-Lindane)

Lindane control of engraver beetles,
Ips pini (Say) in ponderosa pine slash.
Boise National Forest-1973

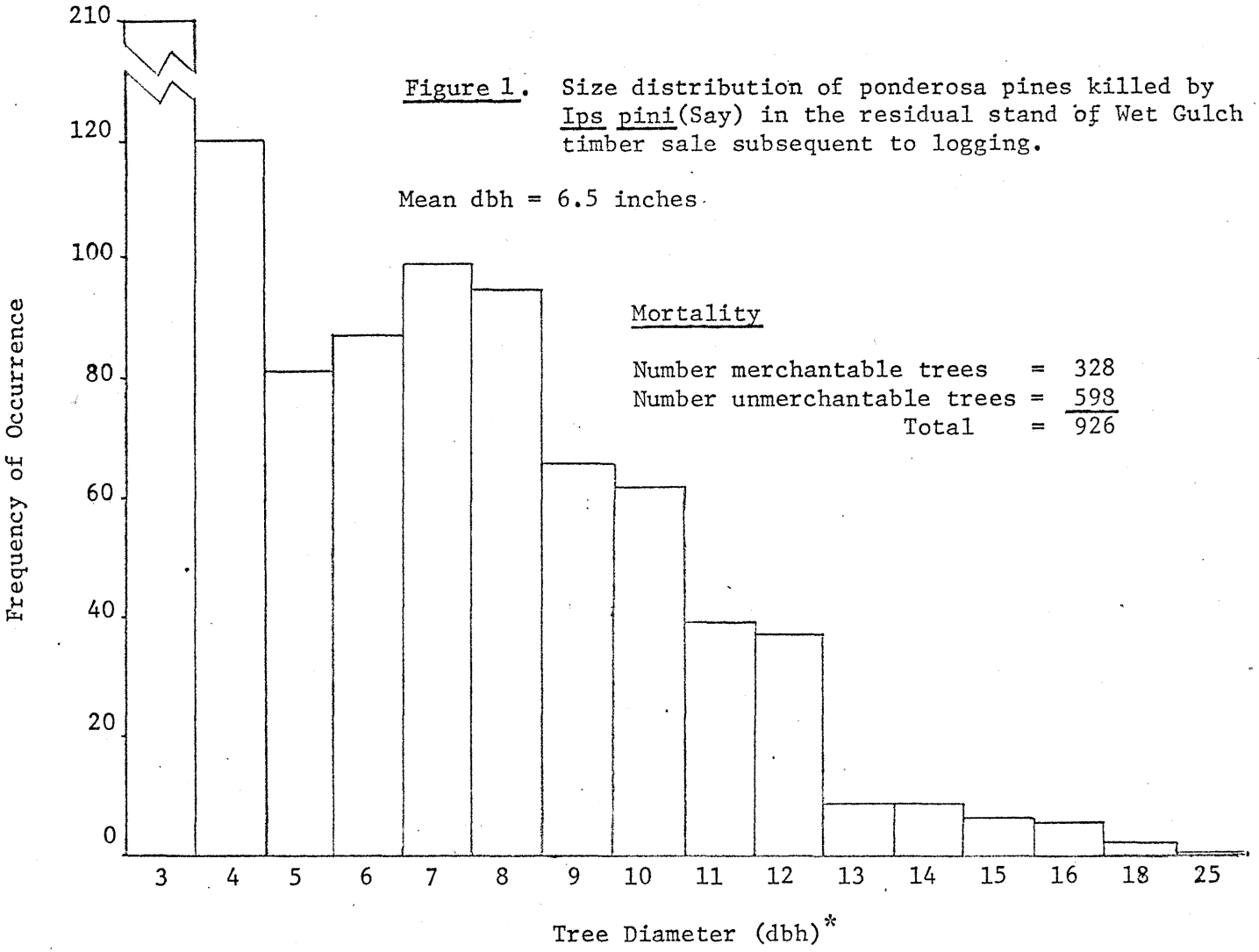


Figure 1. Size distribution of ponderosa pines killed by Ips pini(Say) in the residual stand of Wet Gulch timber sale subsequent to logging.

Mean dbh = 6.5 inches

Mortality

Number merchantable trees	=	328
Number unmerchantable trees	=	598
Total	=	926

*Two and three inch size classes were combined.

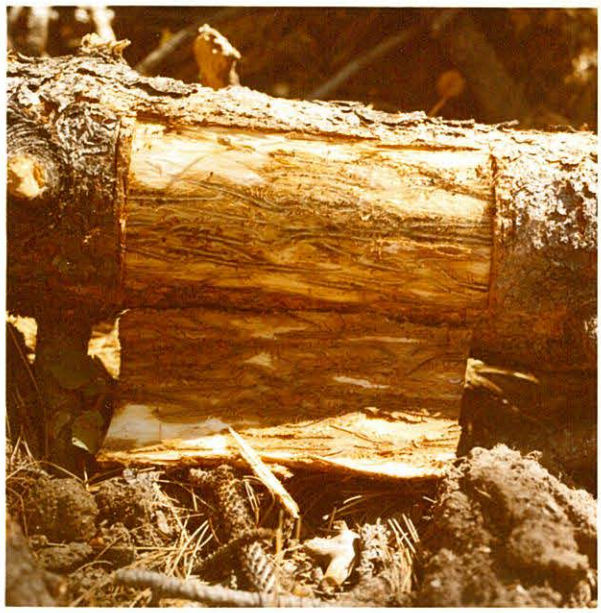


Fig. 2. Ips brood. Virgil Gulch treating unit. Boise N.F., 1973.

Fig. 3. Mistblower in operation. Virgil Gulch treating unit. Boise N.F., 1973.

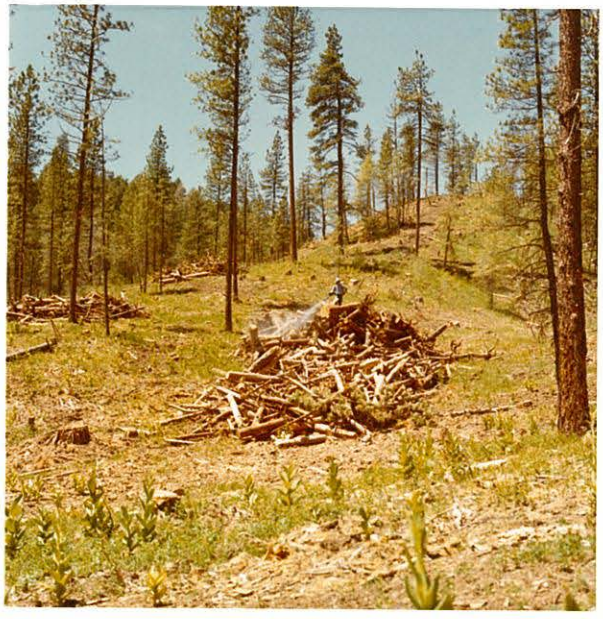


Fig. 4. Seed trees (residual stand). Virgil Gulch treating unit. Boise N.F., 1973.